MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

JPAM0135 – ALGEBRA

2 OCTOBER 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **THREE** pages excluding the cover page.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

Question 1 (10 marks)

a) Simplify the following expression:

$$\left(\frac{2a^3b^2}{ab^{-1}}\right)^{-3}\left(\frac{4a^3b^{-3}}{\sqrt{8a^3b}}\right)^2.$$ [4 marks]

b) Find the quotient and remainder if $6x^3 + 11x^2 - 31x + 15$ is divided by $3x - 2$, using long division. [3 marks]

c) Rationalize the denominator: $\frac{x-5}{\sqrt{x+4}-3}$. [3 marks]

Question 2 (10 marks)

a) Solve the equation: $\sqrt{2x-7} - \sqrt{x} - 1 = 0$. [4.5 marks]

b) Solve the inequality:

i. $|3x - 7| + \frac{3}{2} \leq 5$. [2.5 marks]

ii. $\frac{(2x+1)(x-7)}{x+1} < 0$. [3 marks]

Question 3 (10 marks)

a) If $f(x) = 3 - 2x$ and $g(x) = \frac{5}{2x-3}$. Find:

i. $(fog)(-1)$. [2 marks]

ii. $g^{-1}(x)$. [3 marks]

Continued ...

b) Graph the piecewise function below. State the domain and range of function f.

$$f(x) = \begin{cases} \sqrt{-x} & ; -4 \leq x \leq 0 \\ x^2 & ; 0 < x \leq 2 \\ -x+1 & ; 2 < x < 4 \end{cases}$$

[5 marks]

Question 4 (10 marks)

a) Given a function $f(x) = \frac{1}{2}\log_2(x+4) - \frac{1}{2}$. Graph $f(x)$ by using transformation techniques. Show each transformation in different graphs. State the asymptote and intercept(s) in the last graph. [5 marks]

b) Solve the equation, $3^{x-5} = 27^{x+1}$. [2 marks]

c) Expand the logarithmic expression as much as possible.

$$\log\left[\frac{1000x^2\sqrt[3]{7-x}}{3(x+4)^2}\right]$$ [3 marks]

Question 5 (10 marks)

a) Express $0.\overline{47}$ as a fraction in lowest terms. [4 marks]

b) Expand the expression $\left(2x^2 - \frac{3}{y}\right)^6$ by using Binomial Theorem. Hence, determine the coefficient of x^7. [6 marks]

Continued ...

Keys Formulas

1. Product of Sum and Difference: $(x-a)(x+a)=x^2-a^2$

2. Square of binomial: $(x\pm a)^2=x^2\pm 2ax+a^2$

3. Difference and Sum of Two Cubes: $x^3\pm a^3=(x\pm a)(x^2\mp ax+a^2)$

4. The quadratic formula: $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

5. Arithmetic Sequence: $d=a_{n+1}-a_n;\ a_n=a+(n-1)d;$

$$S_n=\frac{n}{2}[2a_1+(n-1)d]=\frac{n}{2}[a_1+a_n]$$

6. Geometric Sequence: $r=\frac{a_{n+1}}{a_n};\quad a_n=ar^{n-1};$

$$S_n=a\frac{1-r^n}{1-r};\ r\neq 0,1;\ S_\infty=\frac{a}{1-r}$$

7. The Binomial Theorem:

$$(a+b)^n=\binom{n}{0}a^n+\binom{n}{1}a^{n-1}b+\binom{n}{2}a^{n-2}b^2+\ldots+\binom{n}{k}a^{n-k}b^k+\ldots+\binom{n}{n}b^n$$

End of Paper